



## Module Scheme Semester One

2022-23

Module Name:	Design Patterns		
Module Code:	CO664	Academic Year:	2022-23
Tutor(s):	Nicholas Day		
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### Learning Outcomes:

1. Interrogate and articulate the structures and intentions of major Design Patterns
2. Implement Design Patterns in one or more object-oriented languages
3. Evaluate, from requirements specifications/definitions, and propose Design Patterns appropriate to application architecture and implementation

### Assessment Summary:

Assessment Task	Key Dates
CW1 Design Pattern Logbook and Report (100%)	Submission: Thursday 2 February 2023

### Indicative Weekly Content

Week by Week Guide:	Teaching details
1. Week beginning: 26/09/2022 (Timetabling Week 1)	Design Patterns introduction: Revisit principles of good OO, founding principles of DPs, MVC
2. Week beginning: 03/10/2022 (Timetabling Week 2)	<b><u>Lesson Plan (weeks 1 &amp; 2):</u></b> [1] Presentation – Introduction to Design Patterns & MVC <b><u>Lesson Practical:</u></b> [2] Logbook Activity 4 – Python 4 – Conditionals (selection, iteration & functions) [3] Logbook Activity 5 – Python 5 – Object Orientation (classes, objects, inheritance) <b><u>Lesson extended practical and/or self-study</u></b> [4] Logbook Activity 6 – Python Challenge: Extending MVC

3. Week beginning: 10/10/2022 (Timetabling Week 3)	<p>Design Patterns introduction: Revisit principles of good OO, founding principles of DPs, MVC</p> <p><b><u>Lesson Plan:</u></b> [1] Presentation – Introduction to Design Patterns &amp; MVC</p> <p><b><u>Lesson Practical:</u></b> [2] Logbook Activity 4 – Python 4 – Conditionals (selection, iteration &amp; functions) [3] Logbook Activity 5 – Python 5 – Object Orientation (classes, objects, inheritance)</p> <p><b><u>Lesson extended practical and/or self-study</u></b> [4] Logbook Activity 6 – Python Challenge: Extending MVC</p>
4: Week beginning: 17/10/2022 (Timetabling Week 4)	<p>Design Patterns – MVC &amp; Observer Pattern</p> <p><b><u>Lesson Plan:</u></b> [1] Presentation – MVC improved and the Observer DP</p> <p><b><u>Lesson Practical:</u></b> [2] Logbook Activity 7 – Extending the Observer pattern – Data science/visualisation exercise</p>
5: Week beginning: 24/10/2022 (Timetabling Week 5)	<p>Design Patterns – Creational Patterns 2x examples</p> <p><b><u>Lesson Plan:</u></b> [1] Presentation – Factory Method &amp; Abstract Factory</p> <p><b><u>Lesson Practical:</u></b> [2] Logbook Activity 8 – Factory Method – Python tkinter widgets [3] Logbook Activity 9 – Abstract Factory – Python object families</p>
6. Week beginning: 31/10/2022 (Timetabling Week 6)	<p>Design Patterns – Behavioural Patterns 2x examples</p> <p><b><u>Lesson Plan:</u></b> [1] Presentation – Strategy &amp; Iterator</p> <p><b><u>Lesson Practical:</u></b> [2] Logbook Activity 10 – Strategy – Data science/Computer vision with Open CV [3] Logbook Activity 11 – Iterator – Exposing Python's built-in iterators</p>
7. Week beginning: 07/11/2022 (Timetabling Week 7)	<p>Design Patterns – Structural Patterns 2x examples</p> <p><b><u>Lesson Plan:</u></b> [1] Presentation – Adapter &amp; Decorator</p> <p><b><u>Lesson Practical:</u></b> [2] Logbook Activity 12 – Adapter – Data science/Geomatics with matplotlib &amp; cartopy [3] Logbook Activity 13 – Decorator – Using both Python internal and bespoke decorators</p>
8. Week beginning: 14/11/2022 (Timetabling Week 8)	<p>Design Patterns – Creational &amp; Structural Patterns 2x examples</p> <p><b><u>Lesson Plan:</u></b> [1] Presentation – Singleton &amp; Composite</p> <p><b><u>Lesson Practical:</u></b> [2] Logbook Activity 14 – Singleton conventional – implement and confirm object addresses [3] Logbook Activity 15 – Singleton Borg – implement and confirm object addresses</p>

9. Week beginning: 21/11/2022 (Timetabling Week 9)	Design Patterns – Creational & Behavioural Patterns 2x examples  <b><u>Lesson Plan:</u></b> [1] Presentation – Builder & Chain of Responsibility <b><u>Lesson Practical:</u></b> [2] Logbook Activity 16 – select, explain and demonstrate a DP of your choice [3] Logbook Activity 17 – select, explain and demonstrate a DP of your choice
10. Week beginning: 28/11/2022 (Timetabling Week 10)	Design Patterns <b><u>in Java</u></b> – Command & Proxy 2x examples  <b><u>Lesson Plan:</u></b> [1] Presentation - using the SciJava kernel [2] ‘Command’ and ‘Proxy’ in Java and in Jupyter
11. Week beginning: 05/12/2022 (Timetabling Week 11)	Design Patterns – Creational & Behavioural Patterns 2x examples  <b><u>Lesson Plan:</u></b> [1] Presentation – Builder & Chain of Responsibility <b><u>Lesson Practical:</u></b> [2] Logbook Activity 16 – select, explain and demonstrate a DP of your choice [3] Logbook Activity 17 – select, explain and demonstrate a DP of your choice
12. Week beginning: 12/12/2022 (Timetabling Week 12)	Revision and module review
Timetabling Weeks 13-15	<b><u>Winter Break (3 weeks)</u></b>
13. Week beginning: 09/01/2023 (Timetabling Week 16)	Assignment Workshop
14. Week beginning: 16/01/2023 (Timetabling Week 17)	Assignment Workshop
15. Week beginning: 23/01/2023 (Timetabling Week 18)	Jupyter Logbook presentation tutorials
Week beginning: 30/01/2023 (Timetabling Week 19)	<b>Assignment submission – Thursday 2 February</b>

## Reading List

Link to Reading list in  
Keylinks:

<https://bucks-new.keylinks.org/#/list/1946>

### Module Texts

- Moseley R (2007) Developing web applications. John Wiley
- Gamma E, Helm R, Johnson R and Vlissides J (1995). Design Patterns: Elements of Reusable Object-Oriented Software. Addison-Wesley.

### Other useful sources

- Downey AB (2012) Think Python: How to Think Like a Computer Scientist, O'Reilly. (**NOTE: .... or free at <http://www.greenteapress.com/thinkpython/thinkpython.pdf>**).
- Phillips D (2015) Python 3 Object-Oriented Programming. Packt Publishing. (**NOTE: Good OO Python with comprehensive cover of design patterns**)
- Shalloway A and Trott JR (2004) Design Patterns Explained: A New Perspective on Object-Oriented Design (Software Patterns). Addison Wesley. (**NOTE: An accessible interpretation of applied DPs**)
- Anon (2015) PyQGIS Developer Cookbook. Available at <http://docs.qgis.org/2.6/pdf/en/>.
- Burris E (2012) Programming in the Large with Design Patterns. Pretty Print Press.
- Freeman, E., Robson, E., Bates, B., & Sierra, K. (2004). Head first design patterns. " O'Reilly Media, Inc."
- Ryoo (2015) Design Patterns with Python. Lynda.com.
- Stone B (2014) Python GUI Development with Tkinter. Lynda.com.
- Weinman W (2010) Python 3 Essential Training. Lynda.com
- Zlobin, G. (2013). Learning Python Design Patterns. Packt Publishing Ltd
- Dataquest (2019) Jupyter Notebook for Beginners: A Tutorial. <https://www.dataquest.io/blog/jupyter-notebook-tutorial/>
- Inge Halilovic (2017) Markdown for Jupyter notebooks cheatsheet. <https://medium.com/ibm-data-science-experience>
- Jupyter Notebook Tutorial - <https://www.javatpoint.com/jupyter-notebook/markdown-for-jupyter-notebooks-cheatsheet-386c05aeebed>
- Karlijn Willems (2017) Jupyter Notebook Cheat Sheet. <https://www.datacamp.com/community/blog/jupyter-notebook-cheat-sheet>
- <https://www.learnpython.org/>
- Python - <https://www.python.org/tutorial>
- Python tutorial – the 'official' one - <https://docs.python.org/3/tutorial/>
- Python tutorial – free and mobile - <https://www.sololearn.com/>
- W3Schools - Python tutorial at <https://www.w3schools.com/python/>